REMARKS

Claims 1-17 are pending in the present application.

At the outset, Applicants wish to thank Examiner Nguyen for the helpful and courteous discussion with their undersigned representative on January 9, 2008. During this discussion the arguments set forth herein were discussed. The content of this discussion is reflected in and expanded upon in the following remarks. Reconsideration of the outstanding rejections is requested.

The rejection of Claim 1 under 35 U.S.C. §102(b) over Menegoli (U.S. Patent No. 6,133,107) is respectfully traversed.

The present invention provides, *inter alia*, a semiconductor substrate comprising:

> a lightly doped substrate that contains impurities at a low concentration;
>
> a heavily doped diffusion layer entirely covers a top of the lightly doped substrate and is higher in impurity concentration than the lightly doped substrate; and
>
> an epitaxial layer which entirely covers a top of the heavily doped diffusion layer and contains impurities at a lower concentration than the heavily doped diffusion layer (see Claim 1).

From the foregoing, Applicants submit that it is clear that the semiconductor substrate of the present invention is formed of three superposed layers, i.e., a lightly doped substrate, a heavily doped diffusion layer and an epitaxial layer. The heavily doped diffusion layer entirely covers a top of the lightly doped substrate, and the epitaxial layer entirely covers a top of the heavily doped diffusion layer.

The Examiner cites Menegoli in rejecting Claim 1 and alleges that "Referring to figures 12-14, Menegoli *teaches* a semiconductor substrate comprising:

a lightly doped substrate (50, P-) that contains impurities at a low concentration (see figure 12, col. 4, lines 66-67);

a heavily doped diffusion layer (54, N+, see figure 12, col. 5, lines 3-10) which entirely a top of the lightly doped substrate (50) and is higher in impurity concentration than the lightly doped substrate (see col. 4, lines 66-67, col. 1-10); and

an epitaxial layer (60, col. 5, lines 22-26) which entirely covers a top of the heavily doped diffusion layer and contains impurities at a lower concentration than the heavily doped diffusion layer (see figure 12, col. 5, lines 22-26)."

In contrast to Examiner's allegation, Menegoli does not disclose the semiconductor substrate of the present invention. In fact, Menegoli does not disclose an invention relating to a semiconductor *per s*e, but rather Menegoli disclose an invention relating to a semiconductor integrated circuit. This is a basic and fundamental difference between the present invention and Menegoli.

The Examiner refers mainly to Figure 12 of Menegoli in rejecting the claimed invention as being anticipated by Menegoli. However, Figure 12 is a view showing a portion of the structure depicted in Figure 11, though the view of Figure 12 is a view of one step prior to the step of Figure 11.

To be more specific, Figure 12 shows in a large scale a portion (i.e., a cross-sectional view) of the Figure 11 structure, which is surrounded by the field oxide region 74. In Figure 12, the portions outside the field oxide region 74 (i.e., the right-hand side and left-hand side portions of the structure shown in Figure 11) are omitted from illustration. With such a showing scheme of Figure 12, the epitaxial N layer 60 is depicted to entirely cover the

heavily doped N+ layer 54 in Figure 12. However, as shown in Figure 11, in the actual structure disclosed by Menegoli, the epitaxial N layer 60 is defined by the N+ drain region 64 and, thus, the epitaxial N layer 60 does not entirely cover the heavily doped N+ layer 54. Hence, it is clear that at least the epitaxial N layer 60 does not correspond to the claimed feature of "an epitaxial layer which entirely covers a top of the heavily doped diffusion layer and contains impurities at a lower concentration than the heavily doped diffusion layer", as recited in Claim 1. Thus, Claim 1 is not anticipated by Menegoli.

Further, contrary to the Examiner's allegation that Figures 12-14 do show that the diffusion layer (54) does "entirely" cover the lightly doped substrate (50) (see page 7, lines 1-4 of the Office Action mailed August 10, 2007). Applicants again submit that Figures 12-14 are merely different cross-sectional views of Figures 6-11 (see discussion above with respect to the relationship to Figure 11). The Examiner is reminded that Menegoli must be considered as a whole and the out-of-context reliance on Figures 12-14 is inaccurate and inappropriate. The interrelatedness of Figures 6-11 is explicit in Menegoli at column 4, lines 63-65, which state: "A method for constructing an N channel DMOS transistor according to a first embodiment of the invention is shown in FIGS. 4-16" (see also column 4, lines 48-50). The Examiner does not even address this argument in the outstanding Office Action or in the Advisory Action.

The Examiner refers to Figure 12 of Menegoli as disclosing the claim feature of a "heavily doped diffusion layer which entirely covers a top of the lightly doped substrate and is higher in impurity concentration than the lightly doped substrate" as recited in claim 1. However, this assertion by the Examiner is improper, since Figure 12 as well as Figures 13 and 14 show only a restricted portion of a semiconductor circuit device in a large scale, and thus, these figures cannot show a "heavily doped diffusion layer which *entirely* covers a top

of the lightly doped substrate and ... ". In this regard, at column, 6, line 10, Menegoli states that "As shown in Fig. 12, *at a larger scale than prior figures*, ... " (*emphasis added*).

Although Figures 4 and 10 show views corresponding to several steps prior to the step in Figure 12, these figures cannot be ignored as they apply to the relevance of Figures 12-14. To this end, the Examiner's attention is further directed to Figures 10 and 11 (these figures show a larger portion of the semiconductor substrate than Figures 12-14) for a better view of the structure disclosed by Mengoli. Reviewing Figure 10, for example, it is clearly understood that the heavily doped N+ layer (54) is formed selectively, not entirely, in the semiconductor substrate. In this regard, column 5, line 1-5 of Menegoli recites "[a] mask 52, preferably containing nitride, is formed on the surface of the substrate 50 and is patterned to create a dopant introduction window 53. *An N+ type buried region 54 is formed in the substrate 50 through the dopant introduction window 53*" (*emphasis added*). See also Figure 4.

The foregoing disclosure by Menegoli also makes clear that the heavily doped N+ layer (54) is selectively, not entirely, formed on the lightly doped substrate. In fact, as shown in, for example, Figure 10, heavily doped N+ layer is not formed on the portion of the lightly doped substrate, which is between P+ type buried region (58) and the heavily doped N+ layer (54). In other words, the heavily doped diffusion layer (54) does not entirely cover the lightly doped substrate (50) as presently claimed.

In the Advisory Action, the Examiner has indicated that the arguments presented on November 13, 2007, which are largely again set forth above, were not persuasive and that the rejections of record remain. Specifically, the Examiner has continued to maintain the previous rejections over Menegoli as allegedly anticipating and/or rendering obvious the claimed invention. In making this rejection, the Examiner yet again alleges that Figures 12-

14 show that the diffusion layer (54) does "entirely" cover the lightly doped substrate (50) for the reasons given above. In maintaining this rejection, the Examiner clearly continues to disregard the fact that Figures 12-14 are merely different cross-sectional views of Figures 6-11 and, as such, must be considered as a whole. The Examiner does not even address this argument or appear to have even considered this argument and the clear fact that Figures 12-14 are merely different cross-sectional views of Figures 6-11.

Indeed, the text of the Advisory Action is substantially the same as the Examiner's response bridging pages 6-7 of the Office Action mailed August 10, 2007. The only new comment offered by the Examiner is "as long as any single MOSFET has the three superposed layer would meet the claimed invention (see the drawings of the instant invention for details)". However, this assertion does not appear to support the Examiner's rejections and no support is offered as to how a single MOSFET would necessarily meet the requirements of the claimed invention.

In summary, Applicants submit that, contrary to the Examiner's assertions, the epitaxial N layer (60) does not correspond to the claimed feature of "an epitaxial layer which entirely covers a top of the heavily doped diffusion layer and contains impurities at a lower concentration than the heavily doped diffusion layer" and the heavily doped N+ layer (54) does not correspond to the claimed feature of a "heavily doped diffusion layer which *entirely* covers a top of the lightly doped substrate ... ", both as recited in Claim 1. The Examiner is reminded that in order for a reference to anticipate an invention, the reference "must teach every element of the claim" (MPEP §2131). As such, Applicants submit that Menegoli fails to anticipate the claimed invention.

In view of the foregoing, Applicants request withdrawal of this ground of rejection.

The rejection of Claims 2-5 under 35 U.S.C. 103(a) over Menegoli (U.S. Patent No. 6,133,107) in view of the applicants alleged admission of the Prior Art on pages 1-4 of the present specification and further in view of Werner (U.S. Patent No. 6,469,365) is respectfully traversed.

Menegoli is discussed above and each fails to disclose or suggest a semiconductor substrate meeting the limitations of independent Claim 1. The Examiner further acknowledges that Menegoli do not disclose the lightly doped substrate contains phosphorous or boron, the resistance of the epitaxial layer is 10 Ωcm or less, and the lightly doped substrate and the heavily doped diffusion layer are of a first conductivity type, and the epitaxial layer is of a second conductivity type.

Thus, the Examiner cites the alleged admission of the Prior Art on pages 1-4 of the present specification and Werner as showing that lightly doped substrates contain phosphorus or boron and that the resistance of the epitaxial layer is 10 Ωcm or less.

However, as described with regard to the rejection of Claim 1, Menegoli fail to disclose or suggest the claim limitations of "an epitaxial layer which entirely covers a top of the heavily doped diffusion layer and contains impurities at a lower concentration than the heavily doped diffusion layer" and "a heavily doped diffusion layer which *entirely* covers a top of the lightly doped substrate and ... ." Neither the alleged admission of the Prior Art on pages 1-4 of the present specification nor Werner cures the deficiency of Menegoli. Thus, Claims 2-5 are not obvious over the cited references. Furthermore, Claims 2-5 ultimately depend upon Claim 1. Accordingly, Claims 2-5 are patentable over the references due to at least the claim dependency from Claim 1.

According, withdrawal of this ground of rejection is requested.

With respect to the non-elected method claims, Applicants remind the Examiner that MPEP §821.04 states:

> ...if applicant elects claims directed to the product, and a product claim is subsequently found allowable, withdrawn process claims which depend from or otherwise include all the limitations of the allowable product claim will be rejoined.

Accordingly, upon a finding of allowability of the elected product claims, Applicants respectfully request rejoinder of the withdrawn process claims that depend therefrom.

Finally, with respect to the elected species in response to the Election of Species Requirement mailed April 19, 2007, Applicants respectfully submit that, should the elected species be found allowable, the Office should expand its search to the non-elected species.

Applicants submit that the present application is now in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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